APPLICATION

FOR

UNITED STATES LETTERS PATENT

APPLICANT NAME: Fred T. Stout, Jr.

TITLE: SAFETY GUARD FOR HINGED DOOR

DOCKET NO. STT-10-5770

SAFETY GUARD FOR HINGED DOOR

Field of the invention

The present invention relates to a safety device for use with a hinged closure such as a door to prevent injury to fingers that might otherwise become caught between the door and the doorjamb when the door is swung closed. The device has particular applicability as a child safety feature for household doors.

Background of the Invention

In conventional installations, a door is mounted to a frame by two or more hinges which allow the door to pivot about a vertical axis when moving between an open and a closed position. The pivoted edge of the door generally fits closely with the adjacent doorjamb while leaving a substantial gap along the edge opposite the hinge when the door is open. It is therefore very easy for a person to insert an object in this gap when the door is open. Then when the door is closed, substantial leverage is applied to whatever object happens to have been inserted into the gap.

Injuries are often caused, especially to small children, by fingers being trapped between a door and a door frame or a doorjamb. Various designs for door guards have been proposed in the past to overcome this danger. For example, others have proposed the use of a web of plastic material stretched over the space between the door and the jamb when the door is open. However, these prior devices were deficient in one or more respects such as cost, ease of installation, reliability or effectiveness.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a guard which will provide adequate protection against a child getting a finger or other body part caught in the gap between the hinged edge of a door and a doorjamb.

Another object is to provide a guard that is economical to produce and simple to install.

These and other objects that will become apparent upon a full understanding of the present invention are achieved in accordance with the following description.

The invention relates to an elongated protective guard for the opening of a hinged door or a lid, comprising a plurality of elongated elements, each of which is pivotally joined to an adjacent element by a C-clamp. A first element is referred to as a mounting element. Two mounting elements are required, one adapted to be fastened to the door, and the other to a door frame or doorjamb. The mounting element has a generally planar surface terminating at first and second longitudinally extending edges. The planar surface of the mounting element includes means for securing the guard to a doorjamb or to the surface of a door. For example, one or more strips of Velcro may be adhered to the mounting element, with the corresponding strip or strips adapted to be mounted on said doorjamb or door surface for engagement with the first strips. The element may be provided with mounting holes for securing to the door or the frame with threaded fasteners or nails. Adhesives such as epoxy resins or cyanoacrylates, or double-sided adhesive tape may likewise be used to secure the element to the door or the jamb. The first edge of the mounting element is aligned with the surface of the element thereby

permitting the element to be flush mounted either on the door or on the frame or jamb. The second edge is bent at slightly more than a right angle with respect to the planar surface to form a flange having an inner semi-circular seat, and an outer contact surface. The contact surface comprises a planar portion and a curved portion. The planar portion of the contact surface forms an angle slightly greater than 90° with respect to the generally planar surface of the mounting element.

The mounting element is pivotally coupled to a transition element having a generally planar surface terminating at first and second longitudinally extending edges. The first edge forms a flange having an inner semi-circular seat, and an outer contact surface comprising a planar portion forming an angle slightly more than 90° with respect to the generally planar surface, and a curved portion, the contact surface being in contact with the corresponding contact surface of the first element. The second edge forms a second flange extending in the opposite direction to the generally planar surface, in a direction that is approximately180° from the direction of the first flange. This second flange forms an inner semi-circular seat, and an outer contact surface comprising a planar portion forming an angle slightly more than 90° with respect to the generally planar surface and a semi-circular curved portion. The contact surface abuts the corresponding contact surface of the first element.

The mounting element is held in juxtaposition with the transition element using a C-clamp. The C-clamp comprises a base and two arms, each arm terminating in a semi-circular bead projecting toward the corresponding bead on the other arm. The semi-circular seat of the first edge of the mounting element pivotally engages the bead of one

arm of the clamp, and the semi-circular seat of the first edge of the second element pivotally engaging the bead of the other arm. Typically, the sum of the radii of the outer curved portion of the contact surfaces is substantially constant throughout the range of rotation of the elements.

The transition element may be joined to a corresponding transition element attached to the second mounting element, but more typically is joined to a channel element. As with the mounting element and the transition element, the channel element comprises an elongated generally planar exposed surface, and two edges. Each of the edges of the channel element is shaped to form a flange, each flange extending in the same direction away from the exposed planar surface of the element to form a channel-shaped cross section. Both of the flanges terminate in a semicircular concave seat facing a corresponding seat on the other flange. When assembled, the semi-circular seat of the first edge of the transition element pivotally engages the bead of one arm of the clamp, and the semi-circular seat of the first edge of the second element, whether another transition element or a channel element, pivotally engages the bead of the other arm.

Depending upon the width of the gap between the door and the doorjamb, one or more channel elements may be joined to the transition elements or to one another in the same manner.

The guard may optionally include a shape retainer for maintaining a generally semi-circular shape and for precluding the elements from collapsing together as the door is closed. The retainer may comprise a spring for biasing the elements into an arc. A simple yet effective spring is a strip of generally flat spring steel or other metal that is

joined to the underside of one or more of the elements. As the door is swung to the closed position, the underside of the elements presses against and deflects the spring, whereby the spring serves to resist the elements from folding in on one another. The planar portion of the element to which the spring is attached may be made thicker than the corresponding portions of the other elements to accommodate set screws, rivets or other fasteners that may be used to secure the spring to the element.

Typically, the guard is at least about 36" to 48" in length. Obviously, it can also extend from the top to the bottom of the door, particularly in the case of a split door such as a Dutch door.

The invention also relates to a hinged door assembly comprising a door and a doorjamb, the door joined to the jamb by at least one hinge for movement between an open and a closed position. A protective cover extends over at least a portion of the opening between the door and the jamb when the door is in the open position. The protective cover comprises a plurality of elements, and C- clamps pivotally holding each element against the next contiguous element.

Two of the elements are mounting elements, each having a generally planar surface terminating at first and second longitudinally extending edges. The first edge forms a flange having an inner semi-circular seat, an outer contact surface comprising a planar portion forming an angle that preferably is slightly greater than 90° with respect to the generally planar surface, and a curved portion. The second edge is aligned with the planar surface whereby one of the mounting elements is attached to the door and another element is secured to the doorjamb or frame.

A transition element is adjacent to each mounting element and likewise has a generally planar surface terminating at a first and a second longitudinally extending edge, the first edge forming a flange having an inner semi-circular seat, and an outer contact surface comprising a planar portion forming an angle slightly greater than 90° with respect to the generally planar surface, and a curved portion. The contact surface of the transition element is in contact with the corresponding contact surface of the first element. The second edge forms a flange that extends in the opposite direction from the first flange with respect to the generally planar surface of the element. The flange along the second edge likewise has an inner semi-circular seat, and an outer contact surface comprising a planar portion and a curved portion.

A C-clamp is used to couple each element to the next adjacent element. The clamp comprises a base and two arms, each arm terminating in a semi-circular bead projecting toward the corresponding bead on the other arm. The semi-circular seat of the first edge of an element pivotally engages the bead of one arm of the clamp, and the semi-circular seat of the first edge of the next adjacent element pivotally engages the bead of the other arm. The sum of the radii of the outer curved portion of the contact surfaces is substantially constant throughout the range of rotation of the elements.

Depending on the width of the gap between the door and the jamb when the door is fully open, the guard further may include one or more additional elements pivotally joined to the transition element, spanning the gap between the door when open and the doorjamb.

The invention also relates to the method of using the protective guard to prevent injuries when a hinged door is closed. The method includes mounting the guard made as described on the door and on the jamb on the side of the door opposite the hinges.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described with specific reference to the drawings in which:

Figure 1 shows the guard of the present invention installed on a hinged door;

Figure 2 is a top view of the guard assembly;

Figure 3 shows two of the elements pivotally joined together using a channel clamp;

Figure 4 is an enlarged view of a channel element used in Figure 2;

Figure 5 is an enlarged view of a C-clamp used in Figure 2;

Figure 6 is an enlarged view of a mounting element used in Figure 2;

Figure 7 is an enlarged view of a transition element used in Figure 2;

Figure 8 is an enlarged view of a center element used in Figure 2;

Figure 9 is a top view of another variation of the present invention; and

Figure 10 shows the guard assembled with a leaf spring shape retainer.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings, Figure 1 shows a door **12** pivotally joined to a doorjamb **14** by two or more door hinges, one of which is shown as **16,** typically of conventional design. The door and the doorjamb may be made of wood, metal or plastic and their size, construction and details are well known in industry. When the door is

closed, typically there is only a very small gap between the door and the jamb, often covered with a molding or trim piece. When the door is swung to the open position as shown in Figure 1, a wedge-shaped gap **18** is created. This gap is easily large enough to accommodate the fingers or even the hand of an unsuspecting infant. Upon closing of the door, a tremendous amount of crushing or pitching force can be exerted against the finger, possibly with disastrous or at least very painful consequences.

Shown covering at least a portion of the gap **18** is a guard of the present invention. The details of the guard are not evident in Figure 1. Suffice it to say that the guard is positioned with one edge secured with screws **8** or other fastening means to the door and the opposing edge secured to the doorjamb so that inquisitive fingers cannot enter the gap **18**.

Looking at Figure 2, there is shown the functional aspects of the guard **10** as it might appear when mounted on an open door. The guard **10** comprises a plurality of individual elements coupled to one another by C-clamps. Two mounting elements **20** are adapted to be attached to the door and the jamb. Next to the mounting elements are two transition elements **26** each having an outwardly turned flange and an inwardly turned flange. These elements are located next to one or more channel elements **30,** each having two flanges facing the same direction with respect to the planar surface of the element. The flanges of adjacent elements are pivotally held together by a C-clamp **36**.

Figure 3 is an enlarged view of two channel elements **30** held together with a C-clamp. Each of the elements includes a body **70** and two flanges **40** extending away from the exposed surface **32** of the body. Each flange has a concave seat **50** on the inside and

a contact surface **52** on the outside comprising and a generally planar portion **52a** terminating in a convex curved portion **52b**. The C-clamp **36** comprises a base **44** and two arms **46** terminating in semi circular beads **48**. The beads face one another and engage the semicircular seats **50** of one flange of each channel element **30.** Preferably the planar portion **52** of the flanges form an angle that the slightly greater than 90° with respect to the body of the element. Thus, when the elements are fully open as shown in Figure 3, they form an angle of less than 180° with respect to the body **70.** A preferred angle between the body and the flanges is between 80° and 88° whereby the planar portion of the contact surface on the flanges of the two elements will limit the two elements to an opening of between about 160° and about 176°. To facilitate the smooth rotation of the two elements within the C-clamp, the radius of each seat matches the radius of the corresponding bead, and the radius of the convex curved portion of each flange is equal to ½ of the distance of the spacing between the two beads of the clamp. This defines the relationship with respect to all of the element flanges and C-clamps.

Figures 4 through 8 show perspective views of the various components of the guard of the present invention. Figure 4 shows the C-clamp **36** with a base **44** having two arms **46** terminating in a pair of beads **48** facing one another. The clamp preferably is made from the same material as the other elements of the guard. Therefore, if the elements are made from aluminum, the clamp preferably but not necessarily is made from aluminum as well. The space between the arms is sufficient to permit the clamp to be slid over the arms of two adjacent elements during assembly whereby the beads engage the

seats of the elements and prevent the elements from separating while allowing the elements to pivot together within the clamp.

Figure 5 shows one of the channel elements **30** with a body **70** having an exposed planar surface **32,** and two flanges **40.** Each flange has a concave seat **50** on the inside, and a contact surface **52** on the outside comprising and a generally planar portion **52a** terminating in a convex curved portion **52b.** The concave and convex surfaces typically are semicircular in cross section. The guard will typically have two or more of these channel elements, depending on the width of the gap when the door is open and on the width of each individual element.

Figure 6 shows one of the mounting elements **20**. The planar surface **24** of the mounting element may include screw holes (not shown) for mounting the guard on the side edge of a door or doorjamb opposite the door hinge. Alternative means of attachment such as one or more strips of Velcro may be used on the mounting elements to attach the guard to the door and the doorjamb. Still another alternative is the use of an adhesive resin or a strip of double faced adhesive. The mounting element has one flange **22** along one edge thereof. The flange has a concave seat **25** on the inside, and a contact surface **21** on the outside comprising and a generally planar portion **21a** terminating in a convex curved portion **21b.** The concave and convex surfaces typically are semicircular in cross section.

A transition element **26** is shown in perspective in Figure 7. This element contains planar surfaces **28,** a first flange **56** extending in one direction from the planar surfaces and a second flange **58** extending in the opposite direction. The flanges each

have a concave seat **57** on the inside, and a contact surface **72** on the outside comprising and a generally planar portion **72a** terminating in a convex curved portion **72b.** The concave and convex surfaces typically are semicircular in cross section. The transition element allows the safety guard to segue from a flush mounted element **20** into the semicircular curvature of the guard.

In Figure 8 is shown a center element **34**. As with the channel elements, the center element has two flanges **64** extending in the same direction. The flanges terminate in a semicircular curve forming a concave seat **68** in the inside face of the flange. The body **66** of the center element is made thicker than a corresponding channel element so that it will be adapted to receive a retainer spring that serves to prevent door guard from collapsing upon itself as the door is closed. Such a spring is shown in the guard assembly of Figure 10. The spring **80** typically is made from spring steel or other substance with a good elastic memory and is secured to the center element with one or more set screws or other suitable fasteners **82**. The spring may be only one or two inches high even though the guard may extend 30 inches or more along the door. More than one spring may be spaced along the length of the guard to more effectively maintain the convex shape of the guard as the door is pivoted about the hinges from an open position to a closed position. The center element is otherwise dimensioned the same as the channel elements previously described with respect to the flanges, the concave seats and the contact surfaces.

Another alternative of the invention is shown in Figure 9. In this arrangement, the flanges **140** of the elements **130** include semicircular seats **150** as before. Opposite the

seat, the flanges are provided with intermeshing gear teeth **174**. The two channel elements **130** are held together by a C-clamp **136**. As before the C-clamp comprises a base **144**, two arms **146** and two beads **148** facing one another and engaging the semicircular seats **150** in the flanges **140** of the gear channel elements **130**. Although this Figure 9 shows two of the channel elements, it should also be understood that the arrangement of gears may also be used on the mounting elements, and the transition elements as well as the center element if used. It is also understood that the gears can be used for some of the pivots in the guard assembly but not for others.

The various elements of the protective cover may be made from any suitable material. For example, they may be extruded from aluminum or other light weight metal. Alternatively, they can be fabricated from a suitable rigid plastic such as polyethylene, polypropylene, an ethylene-propylene copolymer, polycarbonate, Teflon, Delrin or nylon. Yet another choice is to make the individual elements from a suitable foam material such as sponge rubber or polyurethane, or from a rubbery material such as neoprene. The elements and clamps can be shaped from wood, or may be provided with a wood grain appearance by embossing or by covering with a laminate. If the elements are made from metal, they can be fabricated by molding, machining, rolling, drawing, die casting or extruding. Likewise, if made from a thermoplastic or thermosetting polymer, molding, casting or extrusion can be used to produce the elements. Although the transition, channel and center elements have been described as having a planar surface, it should be understood that they may be slightly convex, generally conforming to the curvature of the guard when assembled.

As an example of the size of the component parts of a typical door safety guard made from extruded aluminum, the individual elements can be between about ½" and 1" wide with the flanges being about 0.1" to 0.2" high. The radius of the semicircular portion of the contact surfaces of the flanges may be from about 0.05 and 0.08" while the radii of the seats would be about 0.01" and about 0.04". The corresponding width of the C-clamp to pivotally hold adjacent elements together can be between about 0.015" and about 0.035" while the height of the arms would be between about 0.1" and 0.25". The spacing between the axes of the two inwardly facing beads depends on the thickness of the element flanges, and can vary from about 0.1" to about 0.2".

It should be pointed out that the guard can be sized to whatever length may be required to protect the lower portion of the door where infants and small children are likely to encounter injury. Alternatively, the guard can extend the entire vertical length of the door, thereby providing the added advantage of substantially closing the air passageway between the edge of the door and the doorjamb thereby greatly decreasing drafts, dust and loss of heat or air conditioned air.

The present invention can likewise be used on swinging doors and bi-fold doors, as well as those mounted on traditional hinges and/or piano hinges. To provide an adequate degree of protection, it becomes necessary to install one of these safety devices on both of the vertical sides of the door, and on both sides of the door frame, thereby providing a shield irrespective of which direction the door is swinging. The invention is also useful for guarding against pinching when used along the edges of wooden or metal boxes or other containers wherein the potential exists for pinching fingers when the lid of

the box or other container is closing. Furthermore, the invention can find use as a protective cover for the doors of motor vehicles such as cars and trucks, as well as for the tail gates of trucks.

While the invention has been described in combination with specific embodiments thereof, there are many alternatives, modifications, and variations that are likewise deemed to be within the scope thereof. Accordingly, the invention is intended to embrace all such alternatives, modifications and variations as fall within the spirit and scope of the appended claims.